A NEW GENUS OF SIMULIIDAE FROM ALASKA

(DIPTERA)

By ALAN STONE, *Bureau of Entomology and Plant Quarantine, United States Department of Agriculture*

During 1947 and 1948 extensive studies of the biology of Alaskan biting Diptera were undertaken by the Alaska Insect Project.[1] Among the large quantity of collected and reared blackflies are two new species belonging to an apparently undescribed genus related to *Prosimulium*. One of the species was first seen by me in the Canadian National Collection as two pupae from Baffin Island. It is my privilege to offer a description of these species.

Gymnopais, new genus

Adults. Antenna 9-segmented; eyes of female small, occupying only about anterior half of head and widely separated from each other; a subshining bulla at side of head just behind eye; in the females and dichoptic males the emarginations opposite the antennae are shallow and the ommatidia-free excision is poorly developed; in the holoptic males the lower facets are abruptly smaller than the upper ones. Mouthparts in both sexes short, the labrum-epipharynx not exceeding the labellae. Hairs of head, thorax, abdomen, and coxae stout, erect or semi-erect, with no fine recumbent hairs; pleural membrane with hairs; metanotum glabrous with a low median ridge. Wing with small basal cell; hairs of wing veins bristle-like, no spiniform ones; radial sector forked, the anterior branch concave, naked on upper side; posterior branch convex, with setae on upper side; vein R_1 ending well beyond middle of wing; basal section of vein R setose dorsally; r-m cross-vein shorter than basal section of radial sector basad of r-m; petiole of medial vein at least twice as long as this basal section of radial sector; submedian fork present; vein Cu_2 with a distinct double curve. Front basitarsus cylindrical; no calcipala on first hind tarsal segment; no pedisulcus on second hind tarsal segment. Claws of female untoothed. Female genitalia: Rather broad; paraproct small and rounded; gonapophyses short curved toward one another apically; 8th sternite well sclerotized, forming a V-shaped plate; genital rod with short staff, no tooth on arm, and rounded arm plates; spermatheca rather small. Male genitalia: Basistyles subquadrate; dististyle triangular, about as long as basistyle, with acute apex but no tooth, and concave inner margin; adminiculum broad, hirsute, with stout basal arms, a ventrally turned median "lip" and ventral ridge, and a pair of slender median appendages from the base dorsally.

Pupa. Nearly naked, the cocoon rarely more than an irregular mass of threads on the ventral surface of the abdomen. Respiratory filaments 2 to 4, extending forward, somewhat swollen basally and tapering; if

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[1]This project was conducted under a transfer of funds from the National Military Establishment to the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

more than three, two of them often short and stout. Dorsal surface of abdomen without retrorse hooklets; ventral surface with 10 to 14 on each of segments 4 to 7, in a single, irregular transverse row on 4 and 5, double transverse row on 6 and 7.

Larva. Length 6-7 mm. Labrum densely hairy; antenna 3-segmented, the first segment long and hyaline; second shorter and colored; third very small and hyaline; entire mouth brush absent, the basal portion as well as the rays; mandibles (Fig. 12) with teeth small and not heavily sclerotized; maxilla with palp short and stout; mentum (fig. 11) with three groups of blunt teeth; no throat cleft; anal ring of hooks complete; anal sclerite (fig. 9) a broad Y, the stem posterior and somewhat thickened and curved ventrally, the arms anterior and bearing short hairs; anal gills 3, tubular, simple.

Genotype: Gymnopais dichopticus, new species.

The genus *Gymnopais* differs from all known genera of Simuliidae in the complete absence of mouthbrushes in the larva. In other respects it agrees with *Prosimulium* except for the complete absence of fine recumbent hairs on the body, the elongate petiole of the median fork, the bulla behind the eye, and the absence of retrorse hooklets on the dorsum of the abdomen of the pupa. From all other genera of the Simuliinae it differs in lacking spiniform hairs on the costa. From *Parasimulium* it is obviously separated by the wing venation and the male genitalia.

The two species here included under *Gymnopais* differ so markedly in certain respects that one might question the relationship. These differences are, (1) the holoptic versus dichoptic condition of the male head, (2) the shape of the first two hind tarsal segments of the male, and (3) the presence or absence of tail hooks on the pupa. Weighing against these points, however, are the close resemblance in the two species of (1) both the male and female genitalia in spite of the great difference in their size, (2) the female heads, (3) the vestiture of the body, (4) the wing venation, (5) the pupa with its unusual respiratory filaments, arrangement of abdominal hooklets, and rudimentary cocoon, and (6) the apparently indistinguishable larvae.

The name of this genus is derived from *gymno,* naked, and *pais,* child, in reference to the exposed condition of the pupa.

Gymnopais dichopticus, new species

Male. Length 3.5 to 4 mm; wing 3.5 to 5 mm. Head dark brown with faint grayish pollinosity laterally, and clothed with black, semi-erect, curved hairs, pointing forward over most of head; head (fig. 2) flattened above, the eyes on anterior half and separated by slightly less than the width of an eye viewed from above; bulla at side of head behind eye, grayish white. Antenna brownish, the scape and pedicel darker; clypeus convex, dull; mouthparts yellowish; second segment of palpus darkest,

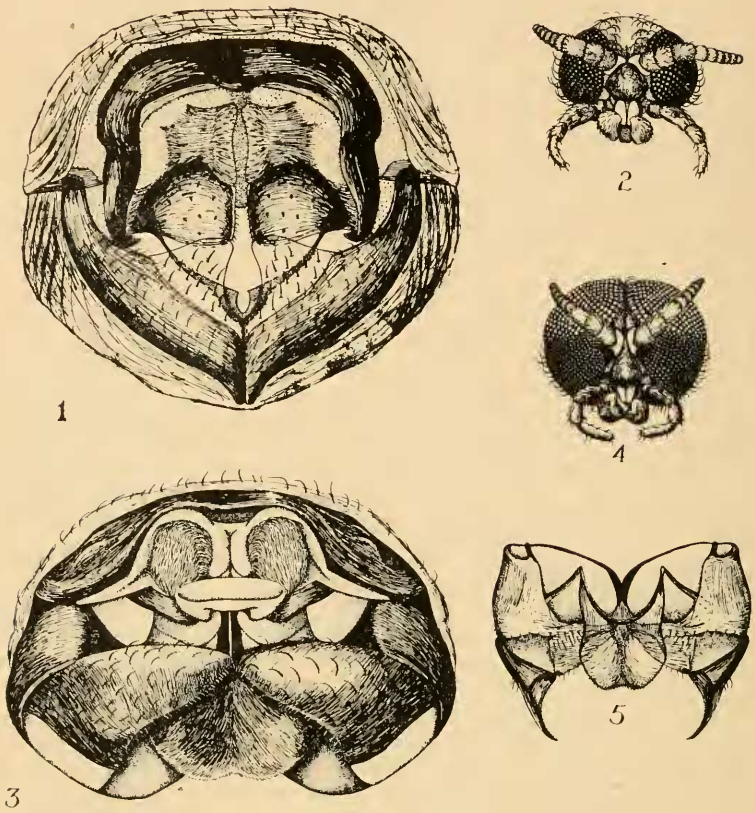

PLATE 24. GYMNOPAIS

Fig. 1, *G. dichopticus*, female genitalia, postero-ventral view of cleared specimen; fig. 2, *G. dichopticus*, head of male, front view; fig. 3, *G. dichopticus*, male genitalia, posterior view from dried specimen; fig. 4, *G. holopticus*, head of male, front view; fig. 5, *G. holopticus*, male genitalia, dorsal view from cleared specimen. (Drawings by Miss Addie M. Egbert.)

with a sensory pit. Scutum dark brown, the humeri usually yellowish brown, the scutellum entirely yellow, the scutum and scutellum with black hairs; pleural sclerites dark brown; pleural membrane with few to many black hairs above; a patch of black hairs at top of mesepimeron; halter yellowish, nude except for short black hairs on the stem anteriorly. Hairs of wing dark brown to black; veins pale, those beyond radius weak; curvature of vein Cu_2 not pronounced. Coxae dark with black hairs; legs mostly yellowish-brown covered with short, fine, brown hairs; hind tarsal segments slender (fig. 6). Abdominal tergites large, brownish black with black hairs; lateral lobe of first tergite with long black hairs; sternites smaller, yellowish or somewhat blackened, with black hairs. Genitalia (fig. 3) broader than head; basistyle yellowish; dististyle black with black hairs; adminiculum large, the dorsal concave portion shining brown with black pile, the posterior margin and ventral ridge with fine yellow pile; a pair of parallel black rods from dorsal surface of adminiculum at base extending toward tenth segment.

Female. Very similar to male. Eyes slightly farther apart, each eye viewed dorsally slightly narrower than the distance between them; a narrow median area of vertex without hairs. Genitalia (fig. 1): width across eighth tergite 1.3 times width of head; ninth tergite black, heavily sclerotized and forming an arch over genitalia; eighth sternite large, black; anterior gonapophyses yellowish, the median margins narrowly darkened, each triangular, with the apex curving medially; paraproct black, the surface concave with black hairs; cercus smaller than paraproct, black with black hairs; arms of genital fork extending to lateral margins of anal lobes.

Pupa. Length 3 to 5 mm. Respiratory filaments (fig. 8) three or four, consisting typically of a dorsal pair extending straight forward, swollen basally, and a ventral pair arising from a short, downward directed stem from the base of the first pair; one or both of the dorsal filaments often short and abruptly tapering; the ventral filaments are always slender, about as long as half of pupa; occasionally this ventral pair is reduced to a single filament. No tail hooks present on last abdominal segment dorsally.

Larva. No specific characters discovered except for those to be seen by dissection of the histoblasts of the pupal filaments of the full grown larvae.

Distribution. Alaska and Yukon Territory.

Type data. Holotype male with associated pupal skin from pupa taken in stream 19.1 miles from Fairbanks on road to Circle City (Steese Highway), Sept. 14, 1948. Paratypes, 38 reared females with associated pupal skins, 11 males with associated pupal skins, 160 pupae, 11 pupal skins, and 58 larvae from the following areas: Three streams between mileposts 117 and 138 on Glenn Highway (Anchorage to Richardson Highway); five streams between mileposts 73 and 112 on Richardson Highway (Valdez to Fairbanks); fifteen streams

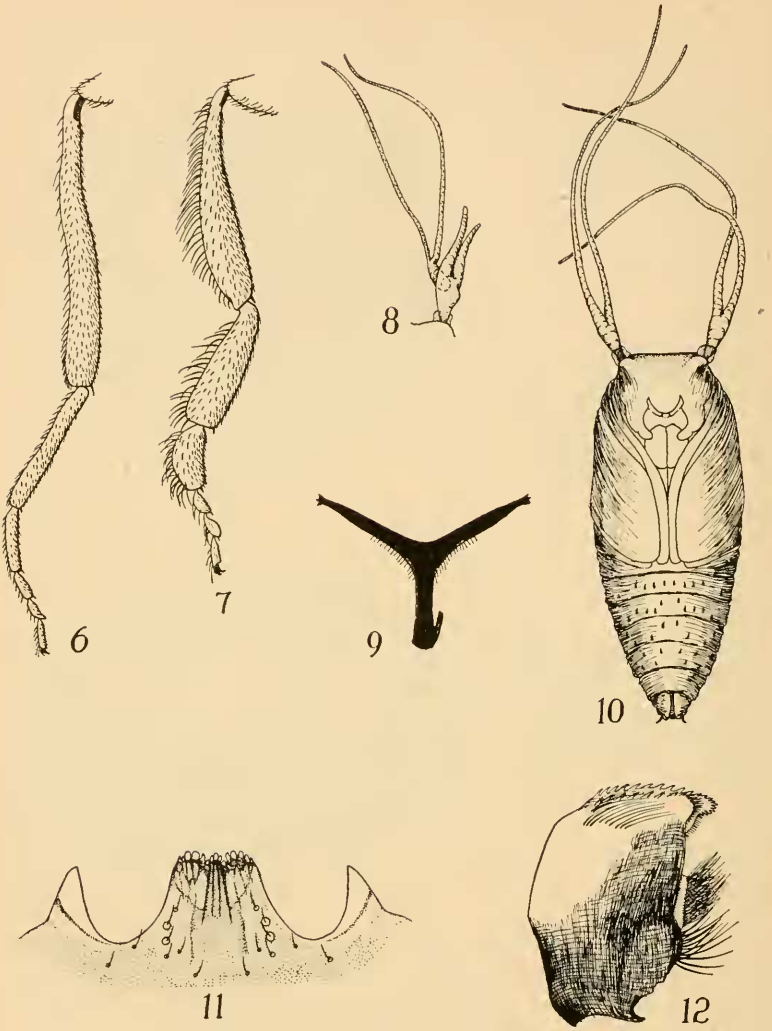

PLATE 25. GYMNOPAIS

Fig. 6, *G. dichopticus,* hind tibia and tarsus of male; fig. 7, *G. holopticus,* hind tibia and tarsus of male; fig. 8, *G. dichopticus,* right respiratory organ of pupa, dorsal view; fig. 9, *G. holopticus,* anal sclerite of larva; fig. 10, *G. holopticus,* pupa, ventral view; fig. 11, *G. dichopticus,* mentum of larva; fig. 12, *G. dichopticus,* mandible of larva. (Drawings by Miss Addie M. Egbert.)

(including type locality) between mileposts 19 and 121 on Steese Highway (Fairbanks to Circle City); Three streams between mileposts 50 and 96 on Nabesna Road (Big Timber to Nabesna); five streams between mileposts 8 and 33 on Tok Cutoff (Slana to Tok); one stream near milepost 41 on Palmer-Willow Road; two streams between mileposts 27 and 68 on Fairbanks-Livengood Road; one stream at Whittier. U. S. National Museum No. 57229. Also one pupa and 7 larvae in the Canadian National Collection collected at Kluane, Yukon Territory, July 28, 1948, by Mason and Hughes.

Biological notes. See after following species.

Gymnopais holopticus, new species

Male. Length 3 to 3.5 mm; wing 3 to 3.5 mm. Head (Fig. 4) mostly covered with the large eyes; these with large facets from just above level of antennal bases, small facets below, the line of demarcation between these sharp; black hairs between eyes and on the occiput and gena; shining whitish bulla at side of head just below level of large facets of eye; clypeus dark with black hair; antenna dark, the flagellar segments 2 to 7 somewhat paler; mouthparts yellowish; second segment of palpus darkest, with a sensory pit; Scutum nearly black, the humeri often paler; scutellum yellow; pleural sclerites dark brown; pleural membrane with few to many black hairs above; a patch of black hairs at top of mesepimeron. Halter yellowish, nude except for short black hairs on the stem anteriorly. Hairs of wing dark; veins pale, those beyond the radius weak; curvature of vein Cu_2 strong. Coxae dark with black hairs; legs mostly yellowish-brown, covered with fine brown hairs, short except for a fringe on extensor margin of hind tibia; hind tibia somewhat thickened; hind tarsal segments 1 and 2 swollen (Fig. 7). Abdominal tergites 2 to 7 dark, with black hair; 8 and 9 mostly pale; lateral lobes of first tergite with long black hair; sternites small, yellowish, with black hair. Genitalia (Fig. 5); width slightly more than half that of head; basistyle yellowish; dististyle black with black hair; adminiculum broad, the apex coming to a ventrally turned, acute angle; apical portion with short pale hairs; dark rods from dorsal surface at base curved outwardly apically.

Female. Head black with black hair, the eyes on anterior half and farther apart than width of one eye, viewed dorsally; median area of vertex without hairs; hind tibia, and first two hind tarsal segments not thickened; hairs of extensor surface of hind tibia not forming a long fringe. Genitalia: Width across eighth tergite about half width of head; ninth tergite yellowish, a fringe of black hairs on hind margin; eighth sternite sclerotized, dark brown, with dark hair; anterior gonapophyses yellowish, the median margins narrowly darkened, each triangular with apex curved medially; paraproct brown, not noticeably concave, smaller than cercus which is rather large, quadrate, with black hairs; staff of genital fork nearly as long as arm, the arm plate rather large; Coloration of body and other structural characters essentially as in male.

Pupa (fig. 10). Length 3.5 to 4.5 mm. Respiratory filaments 2 or 3, consisting typically of an inner and an outer, slender filament from a somewhat swollen base, each usually somewhat shorter than length of pupa; often the inner filament has a dorsal branch arising a short distance beyond base. A pair of strong tail hooks on the dorsum of the last abdominal segment, these slightly smaller in specimens with three respiratory filaments.

Larva. No specific characters discovered.

Distribution. Alaska and Baffin Island.

Type data. Holotype male with associated pupal skin from pupa taken in stream 16.2 miles from Fairbanks on road to Circle City (Steese Highway), August 17, 1948. Paratypes, 38 females with associated pupal skins, 40 males with associated pupal skins, 19 pupae, 67 pupal skins, and 184 larvae from the following areas: Stream between mileposts 137 and 138 on Glenn Highway (Anchorage to Richardson Highway); stream near milepost 193 on Richardson Highway (Valdez to Fairbanks); twelve streams (including type locality) between mileposts 15 and 121 on Steese Highway (Fairbanks to Circle City); stream 2 or 3 miles from Circle Hot Springs; four streams between mileposts 50 and 84 on Nabesna Road (Big Timber to Nabesna); two streams 10.9 and 14.4 miles from Slana on the Slana-Tok Cutoff; three streams between mileposts 42 and 68 on Fairbanks-Livengood Road. U. S. National Museum No. 59230. Also 2 pupae taken at Lake Harbour, Baffin Island, August 12, 1935, by W. J. Brown, in the Canadian National Collection.

Biological notes. The two species are so similar in habitat that they can be most readily discussed together. They were first discovered in Alaska[2] during the 1947 surveys, A. H. Storm collecting pupae of both species in different streams on the Tok Cutoff July 9. Larvae and pupae were collected later in 1947 on other surveys by B. V. Travis, C. S. Wilson, and D. W. Jenkins, but it was not until the extensive blackfly studies of 1948 conducted by Kathryn M. Sommerman, C. O. Esselbaugh, and R. I. Sailer, that the species were reared and both sexes of both species discovered. The adults have never been taken in the field.

The seasonal distribution does not appear to differ for the two species. The first identifiable larva of *dichopticus* was

[2]The two species of this genus are treated as *Prosimulium novum* D. & S. in the paper, "Ecological observations on the blackflies and punkies of central Alaska" by Dale W. Jenkins, Mosquito News 8 (4): 148-154, 1949. This was a very tentative determination made when the first adult was dissected from a pupa, and the 9-segmented antenna and forked radial sector were noted. The male and pupa of *novum* remain undiscovered.

collected July 9, 1947, and the first of *holopticus* July 17, 1948. The first pupae of both species were collected July 9, 1947. The last larva of *dichopticus* was collected September 7, 1948, the last of *holopticus*, August 31, 1948. The last pupae of both species were collected September 8, 1948. Larvae of this genus, too small to determine, were collected from July 2 to 30, 1948.

The pupae are found singly on the undersides of rocks in streams that are usually rather small and shallow, averaging 6 to 8 feet wide and 5 inches deep, with a range of 1.5 to 60 feet in width, and 1 to 18 inches in depth. The streams are swift, flowing from 2 to 6 feet per second and often tumbling. Stream bottoms varied greatly, ranging from a complete cover of small boulders and large rocks to scattered large gravel on mud or sand. The streams were also cold, the average temperature of all of them being 39°F. The type locality of *dichopticus* never exceeded 40°F. all through the season and that of *holopticus* only went to 47.5°. The average temperature of the streams in which *dichopticus* were found was 1° lower than that for *holopticus*, but this may not be significance since it involves a number of streams in which the temperature was taken only twice. The pH of the streams ran from 7 to 8.5 with no difference between the habitats of the two species.

MELANOPLUS RUGGLESI, A MIGRATORY GRASSHOPPER FROM THE GREAT BASIN OF NORTH AMERICA[1]

(ORTHOPTERA ACRIDIDAE)

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In the summer of 1939 there first came to the attention of contemporary entomologists an unusual infestation of grasshoppers in Big Smoky Valley, Nye County, Nevada. Since 1939 many separate bands have moved northwesterly, until by 1949 a very large area of range land was involved in northwestern Nevada, southeastern Oregon, and northeastern California. The migratory movements of the grasshopper concerned have been one of the more striking cases of insect migration in the United States. The situation is of special interest to students of grasshoppers because in this species migratory and solitary phases apparently are well demonstrated.

Gallaway (Jour. Econ. Ent. 41:925-927, 1949) gave a thorough preliminary review of the current series of infestations, and he referred the grasshopper to *Melanoplus occidentalis occidentalis* (Thomas), based at least in part on my iden-

[1]Publication costs paid by author.